Research TODAY FOR A BETTER TOMORROW

SmartState®
SC Centers of Economic Excellence

2020-2021 ANNUAL REPORT

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The SmartState Program® annual report is prepared annually for the South Carolina General Assembly and the South Carolina Budget and Control Board by the SmartState Review Board and the South Carolina Commission on Higher Education in accordance with S.C. Code of Laws §2-75-10. In accordance with S.C. Code of Laws §1-11-425, the following information is provided: Number of reports printed: 350. Cost per report: $5.75. Total printing cost: $2,193.62

OUR MISSION

The South Carolina SmartState Program® serves the public's interest by creating incentives for the state's research universities, in cooperation with other institutions of higher education in the state, to raise capital from non-state sources to fund endowments for specialized research professorships. These professorships in turn serve as the nucleus for unique, university based research centers that cultivate critical, public-private industrial partnerships, expand the state's knowledge base, create well-paying jobs, enhance economic opportunities, and improve the quality of life for the people of South Carolina.

SmartState®
SC Centers of Economic Excellence

WELCOME FROM THE SMARTSTATE REVIEW BOARD

The SmartState Review Board consists of eleven members who serve three-year terms. Three are appointed by the Governor, three are appointed by the President Pro Tempore of the Senate, three are appointed by the Speaker of the House of Representatives, one by the Senate Finance Committee, and one by the Chairperson of the House Ways and Means Committee. The Review Board oversees operations of the SmartState® Program. The presidents of South Carolina's three research universities serve as ex officio, non-voting members.

To My Fellow South Carolinians,

The SmartState® Review Board is pleased to share with you our 2020-21 annual report, Research Today for A Better Tomorrow. We are proud to be embarking on our 20th year as a program of economic excellence. This report reflects on the many accomplishments we have achieved over the last 20 years, and also takes a look at how our Program is preparing to be "future ready" for a better tomorrow. It is thanks to our remarkable Program and its leaders that we have delivered unparalleled research achievements and funding milestones for our state since 2002.

Despite our accomplishments over the last 20 years, the SmartState Program is at a crossroads. Our Program's funding from the General Assembly has run out and the future of the Program is left uncertain. I firmly believe that SmartState has greatly improved our state's well-being and our position to be competitive in a global economy. We ask our state's leaders to reflect on the vision that the General Assembly so carefully established two decades ago, and consider reviving that vision so our state can continue to foster innovation and workforce development at a global level.

Inside this report, you'll find features highlighting accomplishments from each of our three research universities. These stories are merely a glimpse into the scale of research that is happening on our campuses. There are many incredible discoveries occurring within these SmartState Programs every day. I am proud to be a part of such an esteemed Program that has received international recognition and millions of dollars in national funding over the last two decades.

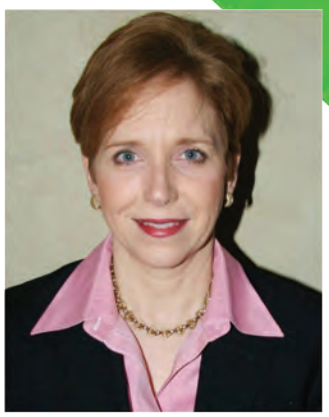
I want to give a special thanks to all those who support us, and acknowledge the vision of the South Carolina General Assembly members in creating this extraordinary SmartState Program. It is through our Program's leadership, financial discernment, collaborative business partnerships, and tireless research efforts that this state-of-the-art Program is able to fulfill its promise to our state—a promise of an improved knowledge economy, a robust workforce with higher paying jobs, and a distinguishing reputation for our state. We look forward to seeing what this Program continues to do for South Carolina's future!

Karoly "Charles" Kerekes, Vice Chair
SmartState Review Board
Appointed by the Governor

MEET THE BOARD

Karoly (Charles) Kerekes
Appointed by the Governor

C.W. (Chuck) Garnett
Appointed by the Governor



Lisa Main
Appointed by the Speaker of the House

Robert W. Pearce, Jr.
Appointed by the Speaker of the House

Melvin C. Williams
Appointed by the President Pro Tempore of the Senate

Roberta Bankhead Wood
Appointed by the Chairman, House Ways & Means Committee

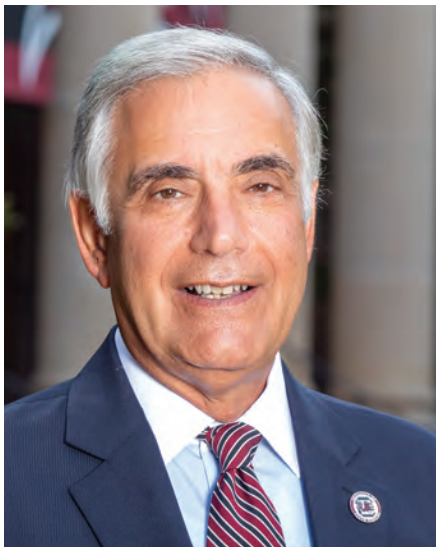
ABOUT OUR PROGRAM

Research Today for A Better Tomorrow is the timely theme selected for this year's SmartState® Program annual report. Nearly two decades ago, the General Assembly had the incredibly brave vision to create a new era of cooperation between our state's three major research universities, healthcare systems, and private businesses to build our state's knowledge economy and sustain a lifetime of economic prosperity for all of South Carolina. The vision was named the Endowed Chairs SmartState Centers of Economic Excellence Program. Thanks to the legislature's incredible leadership and nourishment of this Program for nearly 20 years, the SmartState Centers have achieved a multitude of unprecedented research developments, economic achievements, and international recognition for the state of South Carolina.

Composed of world-class researchers, scientists, and experts, the Endowed Chairs Program has grown to include 76 Endowed Chairs at 51 Centers, raising nearly $3.2 billion ROI dollars over the last two decades. Using our research universities as its drivers, this multiprong economic development strategy has allowed South Carolina to grow our talent pool, while expanding business investments within our state. Simultaneously, the SmartState Program has attracted others from outside our state to invest in our economy. The Program has remained steadfast, achieving great accomplishments while persevering through the challenges of the last 20 years, including technological advancements, economic booms and recessions, demographic shifts, climate change, social changes, and most recently a global pandemic.

As we consider what is next for the SmartState Program, we challenge South Carolina's leaders to reflect on the success of this Program over the years. This report includes insight from some of the Program's longstanding leaders and supporters who have shared their ideas, hopes, and aspirations for SmartState. We invite you to read on and also take a look at some of this year's cutting-edge discoveries, ideas, and industry solutions. Inside the workings of Dr. Leslie Lenert's Center, a groundbreaking COVID vaccine registry software is being built. Dr. Laine Mears is leading Clemson University's THINKER Graduate Program that is unlike any other traineeship in the country to fill the manufacturing skills gap. At the University of South Carolina, the SmartState Center for Strategic Approaches to the Generation of Electricity works with local companies to make the energy sector more sustainable.

It's no secret that South Carolina's knowledge economy is fueled by the SmartState Program. It is a fundamental driver of regional growth. It is a key ingredient to a healthy South Carolina economy. South Carolina's sizable premium in wages is directly and indirectly related to the SmartState Program. Through research and education, partnerships and investment from businesses, and the attraction of federal research dollars, SmartState has pivoted the South Carolina economy to one of international competitiveness. We invite you to turn the page and read more about the remarkable people and happenings that made this year, and the last 20 years of this Program what it is today. It is our hope that our state's leaders will see the value of this economic ecosystem that's been nourished and constructed to advance the betterment of our state and its people.



HARRIS PASTIDES, PH.D., MPH
Interim President
University of South Carolina

"For two decades, the University of South Carolina has been a proud part of the visionary alliance that created the SmartState Centers for Economic Excellence. During the earliest years of the program, I was serving as the university's Vice President for Research, engaging with our faculty researchers to develop competitive proposals that would spark the imagination of businesses and entrepreneurs across South Carolina and lead to productive partnerships. SmartState has served the state of South Carolina well through the collaborative efforts of our legislature, our senior research universities, and the business sector. Together, we have invested in critical research, promoted innovation, fostered the development of new businesses, and created jobs and economic opportunities statewide."

DAVID J. COLE, M.D., FACS
President
Medical University of South Carolina

"The South Carolina SmartState® Program is critical to growing the knowledge-based economy in South Carolina and is key to MUSC's ability to deliver on our mission of education, research and patient care. As the state's only comprehensive academic health sciences center, we remain committed to the collaboration and innovation that results from recruiting and retaining world-class experts who are transforming health care science and delivery."

JAMES P. CLEMENTS, Ph.D.
President
Clemson University

"The SmartState® Program has made an incredible impact on South Carolina these past 20 years, building the state's knowledge economy and driving economic growth. Clemson University is proud to be a part of this program, which is making a difference across this great state."

SAGE SmartState Center brings solutions to power problems

The SmartState Center for Strategic Approaches to the Generation of Electricity works with local companies to make the energy sector more sustainable.

Even as laws and priorities shift, the need for sustainable and affordable energy remains. The University of South Carolina's SmartState Center for Strategic Approaches to the Generation of Electricity (SAGE) is solving pressing issues facing the power industry with input from local companies and support from home-grown student researchers. Since its inception in 2007, the center's mission has been to integrate existing legacy systems with new technologies, an approach that could kick-off lasting, immediate change in the nation's power sector. And with close ties to South Carolina's power industry via its board of directors, SAGE is uniquely positioned to bring these new technologies to market.

Finding new solutions using old technologies

Collaborating with Santee Cooper, SAGE is currently using biomass waste from a logging company in the Upstate. SAGE Chair and Chemical Engineering Professor Jochen Lauterbach says that like coal, the energy in biomass is generated from carbon. His vision is that existing coal power plants could use this type of biomass as an alternative fuel.

"Instead of digging up the carbon from the ground, we're basically reusing a carbon that's already been dug up and gone into the tree," he says.

Storing energy from renewables

Storing energy in the grid is one of the biggest issues we face with renewables. SAGE is tackling this by focusing on ammonia, which can be generated using renewable energy like wind or solar, safely stored, and converted back into a fuel by breaking it down into hydrogen.

"Part of our research is finding ways to make ammonia in a more sustainable way," Lauterbach says. "The other part is once you have the ammonia, you can't feed it directly into a fuel cell. You have to crack it into hydrogen and nitrogen. We have patents filed for catalysts to do that, and that's actually a technology that is becoming mature now and is starting to get transferred into the marketplace."

Finding success

For SAGE, success is twofold. Lauterbach wants to train his students to become leaders in the field and he also wants to see their technologies scaled up and brought to the marketplace where they can make a difference.

"There's a huge amount of interest in what we're doing right now," Lauterbach says. "There's almost not a week that goes by where I don't get an email from someone that wants to get into this or wants to collaborate with us."

Professor Jochen Lauterbach leads the SAGE Center at UofSC, which is discovering technological advancements that make electricity and power more sustainable.

Center for Healthcare Quality creates innovative vaccine registry software, while improving quality care for SC's rural communities.

Leslie Lenert, MD, MS, FACP, FACMI, Endowed Chair for Healthcare Quality Informatics, has gained national attention for a vaccine registry software called VACTRAC that he and his team have built over the last two years. This unique registry index serves as a model for identifying high-risk neighborhoods for vaccine outreach efforts.

"At the onset of the COVID-19 pandemic, our students became passionate about reaching our local underserved communities to provide them with access to healthcare and information," says Dr. Lenert. "As part of my efforts to empower students to act on their passions, coupled with the tremendous needs of the COVID pandemic, I knew this was a project we needed to prioritize."

Using MUSC's current patient registry and social determinants of health data donated by JVION, Dr. Lenert and his team worked to develop the VACTRAC software that would allow students, under the supervision of MUSC's Chief Quality Officer, Dr. Danielle Scherer, to find and reach out to MUSC patients in rural and underserved communities who were at high-risk of COVID-19 challenges, and guide them to test sites. Later, as the pandemic progressed, the software was adapted to track vaccination status of MUSC patients by accessing SCDHEC's Statewide Immunization Online Network (SIMON) database.

Dr. Lenert explains the VACTRAC project was developed in two phases. The first phase was to build a software infrastructure to integrate patients' clinical data and social determinants of health data based on their neighborhood, into a single database students could use to guide their outreach efforts. Once that software was created, students working in small teams used the software collaboratively to reach out patients residing in underserved neighborhoods regarding the pandemic and testing procedures. Phase two began as the vaccine became available. Students used new capabilities of the software to check patients' vaccine status and then to reach patients to help them overcome various barriers to initial vaccination, follow up with patients to get their second shot when needed, and even give patients information on boosters. This second phase includes a quality improvement study comparing the effectiveness of outreach guided by social determinants of health versus outreach guided by clinical risk.

Working with the American Immunization Registry Association, Dr. Lenert and his team are testing advanced systems that help immunization registries work with health care providers on population health efforts.

"Traditional registries report on one individual at a time," explains Dr. Lenert. "We have created software to make the data in immunization registries available to hundreds or thousands of patients at a time using Bulk FHIR queries (Fast Health Care Interoperability Resource). A fast single query made daily gives providers the latest data on vaccination status of populations of patients to target outreach efforts to those most in need. We believe a population health approach for vaccination outreach is essential for both for COVID-19 and to help their patients catch up on other vaccinations missed during the pandemic."

Dr. Lenert's VACTRAC software is leading vaccine tracking innovation for the nation, making data more readily available for population health. Not only that, it is also helping to improve the quality of care for all South Carolina communities.

Dr. Leslie Lenert at MUSC has gained national attention for his newly created vaccine registry software called VACTRAC.

Clemson University's THINKER Graduate Program Aims to Close the Skills Gap in Advanced Manufacturing Across the Educational Spectrum

Laine Mears, Ph.D., P.E., the BMW SmartState Endowed Chair in Automotive Manufacturing, has worked to create a new national model for graduate education in advanced manufacturing that aims to close the skills gap in manufacturing. The program, called THINKER, is the first in the nation to bring together graduate students, undergraduate students and technical college students in project teams to tackle smart manufacturing system designs. It is focused on new approaches to educating a range of disciplines in advanced manufacturing and is backed by a $3 million grant from the National Science Foundation.

"It is expected that as many as two million manufacturing jobs could be left unfilled by 2025," explains Dr. Mears. "Economic expansion and baby boomer retirements will likely create a need for additional people who understand advanced technologies. It is especially crucial for South Carolina, where manufacturing accounts for about 17 percent of our economy. That's more than 50 percent higher than the national average."

THINKER is an acronym for Technology-Human INtegrated Knowledge, Education and Research. The program was created to foster well-prepared leaders across numerous roles in advanced manufacturing who can help close the skills gap. Students who matriculate through the program understand the interaction of machines, people, and data. It equips students with both technical skills and "people skills," such as communication and collaboration.

The program is creating a new national model for graduate education by putting students from normally separated programs into a manufacturing environment and teaching them how people and technology work together. The program ranges from Engineering to Computer Science to Psychology to Learning Sciences, and includes technical college, undergraduate and graduate students. It also teaches how important people are to manufacturing and how new technologies can support that vision.

"We hope the impact can quickly ripple through the broader regional economy," says Dr. Mears. "Every job in manufacturing creates another 2.5 jobs in local goods and services."

David Clayton is the executive director of the Center for Manufacturing Innovation. He says, "This collaboration underscores the depth of cooperation between institutions on an issue crucial to South Carolina's economic well-being."

The program is transforming education in advanced manufacturing. It also presents unique opportunities for advancing education research, while building economic development for the state.

Dr. Laine Mears at Clemson has created the THINKER Program, a new national model for graduate education that helps bridge the skills gap in advanced manufacturing.


CUICAR
Manufacturing

The Economic Impact of the SmartState Program

"Despite the fact that South Carolina was hit hard by the pandemic-induced recession of 2020, the state's economy has nevertheless remained resilient and has maintained a steady pace of recovery throughout 2021. A major driver of these positive trends has been the resilience of the knowledge economy itself, which experienced far fewer relative job losses compared to the state as a whole. The fastest growing regions in the United States throughout the 21st century have been those with a strong and vibrant knowledge economy, and this trend will likely continue in the coming decade. The SmartState Program plays a pivotal role in sustaining the ongoing development of this knowledge economy in the Palmetto State, and since 2002, has generated over 19,000 jobs with annual salaries that pay significantly above the state average."

– Dr. Joseph Von Nessen, Research Economist, Darla Moore School of Business, University of South Carolina

The primary mission of the SmartState Program is to generate high-skilled, high wage jobs in South Carolina. The research centers established by SmartState funding help to expand the state's knowledge base, create public-private partnerships, support startup firms, and help retain highly talented workers. The SmartState Program actively supports the ongoing development of the knowledge economy – and jobs in the knowledge economy are among the highest paid of all industries in South Carolina. The creation of high wage jobs across the state has continued to help South Carolina remain an attractive location for job seekers and economic expansion.

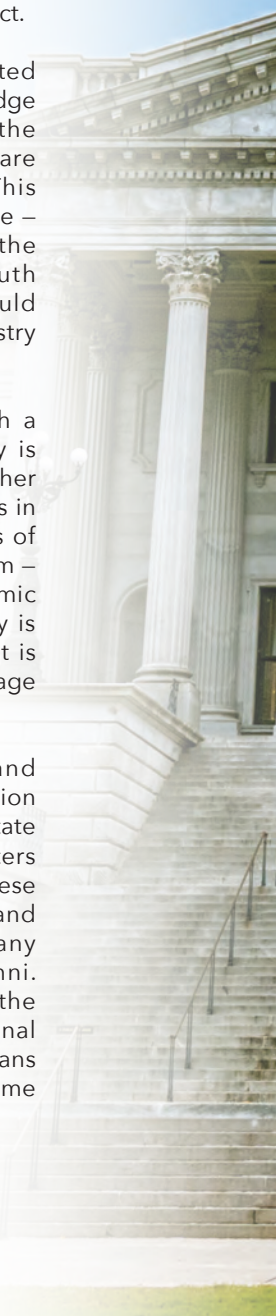
The knowledge economy relies heavily on intellectual capital. In general, professions within the knowledge economy are highly technical and typically require extensive academic training in mathematics and science as well as the ability to engage in complex problem solving. Tasks are often both theoretical and practical, combining the creative skills necessary for innovation and technological development with the practical knowledge of commercializing new ideas, which is what leads to regional economic growth and development. The intellectual talents required for jobs in these professions are highly sought after across the world, and regions with high concentrations of these professions generate enormous human capital resources and knowledge spillover effects.

As of 2021, the SmartState Program is responsible for helping to create and support approximately 19,465 jobs in South Carolina, which are associated with approximately $3.9 billion in economic activity and $1.2 billion in labor income for South Carolinians that would not exist otherwise. Approximately 7,446 (38%) of these positions are knowledge economy jobs created directly through the SmartState Program, with the remaining 12,019 (62%) arising from additional spending activity generated through the economic multiplier effect.

The specific employment multiplier associated with these estimates is 2.6 – for every 10 knowledge economy jobs directly created through the SmartState Program, an additional 16 jobs are created elsewhere in South Carolina. This multiplier effect is well above the state average – that is – each new job created through the SmartState Program increases total South Carolina employment by more than it would if that job had been created in another industry of comparable size.

The average annual salary associated with a SmartState job in the knowledge economy is $77,613. This is approximately 61 percent higher than the average annual salary among all jobs in South Carolina. When examining the salaries of all jobs associated with the SmartState Program – including those created through the economic multiplier effect – the average annual salary is estimated to be $59,360. This dollar amount is approximately 23 percent higher than the average annual salary among all South Carolina jobs.

Two key drivers for economic growth and development in the 21st century are innovation and technological development. The SmartState Program creates and supports program centers designed specifically to encourage both of these activities through investments in research and development, startup companies, company recruitment, and retaining talented alumni. Ultimately, it is an ongoing expansion of the knowledge economy that will create additional high wage, high skilled jobs for South Carolinians – and the SmartState Program has clearly become a state leader in these efforts.



SmartState Program® By The Numbers

3
Research Universities
Clemson, MUSC, UofSC

6
Industry Clusters[1]

51
SmartState® Centers of Economic Excellence

76
SmartState Endowed Chairs appointed (of the 86 created)

$197.6M
State Funds Invested[2]

$3.9B
Return on Investment[3]

19,465
Total Employment (All jobs)[3]

$77,613
Average Salary of a Knowledge Economy Job[3]

111
Start-ups and Corporate Relocations[4]

1 Industry-focused research is conducted in six areas of global importance: Advanced Materials and Nanotechnology, Automotive and Transportation, Biomedical, Energy, Information Science, and Pharmaceutical.

2 Includes $180 million from the State Education Lottery appropriations and $17.6 million accrued interest from SmartState Program® endowment.

3 The figures reported are from the November 2021Economic Impact of the SmartState Program® analysis conducted by the Darla Moore School of Business. Of the total 19,465 jobs, 7,446 are knowledge economy jobs created directly through the SmartState® Program, including 812 SmartState personnel, 1,191 start-up company and corporate relocation personnel, and 5,443 employed though Extramural Research Funding and alumni. The remaining 12,019 jobs are indirect employment arising from the economic multiplier effect.

4 See page 15 for a listing of investors, start-ups and corporate relocations.

Investors, Start-ups, and Corporate Relocations in S.C.

CORPORATE AND ORGANIZATIONAL INVESTORS

More than three dozen companies have invested $500,000 or more in theSmartState Program®.

- Abney Foundation
- BASF
- Bank of America Foundation
- Biomass Gas & Electric
- BlueCross BlueShield Foundation of SC
- BMW
- Comporium Group
- Daniel Island Company
- Dialysis Clinics, Inc.
- Duke Energy
- Duke Energy Foundation
- Electric Cooperatives of South Carolina
- Fluor Corporation
- Force Protection Industries
- G. E. Renewable
- General Atomics
- George B. Sibert Annuity
- GlaxoSmithKline
- Greenville Hospital System
- Health Sciences South Carolina
- J.E. Sirrine Foundation
- Kellogg Foundation
- Kentwool
- Michelin
- Okuma
- Orbis
- Oshkosh Corporation
- Palmetto Health
- PalmettoNet
- Research to Prevent Blindness
- Robert Wood Johnson Foundation
- Samuel Freeman / Donaldson Charitable Trust
- Santee Cooper
- Smith & Nephew
- Spartanburg Regional
- SRNL Healthcare System
- The Duke Endowment
- The Spaulding Paolozzi Foundation
- Timken
- Toyota
- Volvo
- Westinghouse
- ZF

START-UP COMPANIES

Start-up companies founded as a result of research at UofSC, MUSC, and Clemson University:

- 52 Inc.
- Adhere Ly LLC
- Advanced Photonic Crystals
- Career Care Solutions
- Cephos
- Cicadia
- Clinacuity
- Closing the Gap in Healthcare, Inc.
- Coastal Focus Market Research Company
- DF Werke, LLC
- Dokbot LLC
- Doxy.me
- eCAM
- ENCI Therapeutics and NeuroEpiginex, LLC
- FibroBiologics, LLC
- Fibro Therapeutics, Inc.
- First String Research
- GeoMat, LLC
- Glycopth, LLC
- Gruthan Bioscience
- Hydrogen Hybrid Mobility, LLC
- ImmoMod, Inc.
- InDepth Pharmaceuticals
- Inquisatex Epitherapeutics, LLC
- IntrusinMyFamily.com
- Light Solutions, LLC
- Lydex Pharmaceuticals
- MagAssemble, LLC
- MicroVide
- MitoChem Therapeutics, LLC
- MitoHealth, Inc.
- Neuroene Therapeutics
- NeuroEpigenix, LLC
- NextGenEn
- NXT
- Oncocyclix, LLC
- Oncology Analytics
- Palmetto Fuel Cell Technologies, LLC
- Palmetto Green
- Parallel Permeation, Inc.
- Patient Guided Health Solutions, LLC
- Perfect Mixing, LLC
- Protara, LLC
- SAGE Energy Solutions
- Schnellgen, Inc.
- SemiAllogen, Inc
- SimTunes, LLC
- Simulation Training Solutions, LLC
- Smart Innovations, LLC
- South Carolina Science Solutions, LLC
- Specialty & Custom Fibers, Inc.
- Sycamore Biopharm, LLC
- Tetramer Technologies
- Vortex Biotechnology Corporation
- Zeriscope, Inc

CORPORATE RELOCATIONS

Companies that have relocated to South Carolina to benefit from the expertise, resources, and graduates in the SmartState Program®:

- A. Berger
- American Titanium Works (ATW) Manufacturing
- American Titanium Works (ATW) Technology Center
- BMW Information Technology Research Center (ITRC)
- CADFEM U.S.*
- CECAS
- CGF
- COE Optics
- Change2Target
- CleanEnergy
- Computech*
- Cooliemon Technologies*
- C-P-S Group
- CU Corporate Foundation
- DreamWeaver*
- EHD Tech
- Environment and Health Inc. (EHG)
- Esys Automation
- Fields Group, LLC.*
- Focus Chemicals*
- Formel D
- FSI - Advanced Research
- Greenway Energy, LLC
- In-tech
- Innoventure
- IndySoft
- Intec U.S. Inc.
- Intellectual Capital Group
- International Mold Co.
- JTEKT Technology Center
- Mallet Technology*
- Michelin
- Michelin Incubator
- MTC Federal Credit Union
- Mumford Industries*
- OmniSource
- OncoCube Therapeutics
- Parkway Products
- People Link
- Proterra, Inc.
- RESA (AIG-Clemson)
- Roding*
- Sage Automotive Interiors*
- SC Manufacturing Alliance
- SC Research Authority (SCRA)
- Senex Biotechonology, Inc.
- Simpack, Inc.
- SMT
- SWJ Breilman
- ThermoPur Technologies*
- Tigges*
- Tenin Holding
- Toho Tenax*
- TR Fastenings
- Trulite

** In May 2012, CU-ICAR (Clemson University International Center for Automotive Research) opened the doors to the Center for Emerging Technologies (CET) facility, its first multitenant building. CET provides office, administrative, and laboratory space for transportation, technology, and energy sectors. These companies have positioned themselves on the CU-ICAR campus to be close to the SmartState Endowed Chairs and their research teams.*

SmartState® Centers of Economic Excellence:

Research **TODAY** FOR A BETTER **TOMORROW**

A look back at the history of the Centers of Economic Excellence

2002

In 2002, the South Carolina General Assembly recognized the incredible opportunity to create an innovative revolution in South Carolina's knowledge-based economy. It created the South Carolina Centers of Economic Excellence (CoEE) Program, also known as the Endowed Chairs Program.

The Program awarded $200 million in Education Lottery proceeds to help the state's research universities attract non-state investment in advanced research with the hopes of building academic-industry partnerships and creating commercial applications that build our state's knowledge-based economy. The endowed professorships are held at South Carolina's three senior research institutions: Clemson University, the University of South Carolina, and the Medical University of South Carolina. Each Center specializes in research that is aimed at securing major private sector funding and federal grants for the state, and over time, increase the state's knowledge base and stimulate the state's economy.

2007

The CoEE Program thrived in its fifth year, reaching the $100 million mark in non-state matching pledges for advanced scientific research in critical industry areas such as automotive engineering, biomedicine, future fuels, and cancer research. At the end of 2008, 42 Centers had been created with 21 world-class researchers recruited to lead them.

2012

A decade after inception, the SmartState Program had 42 world-class researchers filling Endowed Chairs at the three research universities. Each Chair had an impeccable research team, working around-the-clock to create economic opportunities for South Carolinians. The results were phenomenal: $1.4 billion in investment in the state's economy, plus the creation of more than 8,000 jobs. The program was responsible for the creation of 22 startup companies.

South Carolina SmartState® Program

2017

85 percent of the Endowed Chair positions have been filled. South Carolina State University received its first Endowed Chair, Dr. Marvella Ford, an expert in health disparities. The SmartState Program has become one which other states look to as a model for university-based public-private partnerships that foster innovation, launch companies, and create jobs.

2021

Nearly 20 years in existence, the SmartState Program faces a funding crossroads. Supporters and Program leaders urge the South Carolina legislature to recall its vision from 2002 that stated this Program would support the critical role of advancing innovation, creating economic and educational opportunities, and improving overall quality of life for the state's citizens.

A SPECIAL TRIBUTE TO

Senator Hugh Leatherman

The leaders and members of the SmartState Centers of Economic Excellence Program will be forever grateful to Senator Hugh Leatherman (1931-2021) for his unwavering support of the SmartState Program. Since the Program's existence, Senator Leatherman was a tremendous advocate for its vision and mission. As the powerful chairman of the Senate Finance Committee, Senator Leatherman had the unique ability to see the promise in projects such as the SmartState Program that leveraged state and federal dollars for the greatest return on investment. His presence and support will be greatly missed.

A look ahead...

Thanks to the support of some of South Carolina's most influential leaders, the SmartState Program has much to be thankful for today. We took a moment to speak with some of those leaders to reflect on the Program's success and asked them what their hope is for the future of the SmartState Program.

MELVIN C. WILLIAMS
SmartState Board Member
(2006 – Present)

"To bear witness to the successful research and creation of startup companies has made it very rewarding to be associated with the SmartState Program. The Program was built on a strong foundation, allowing it to continue to thrive and build on its continuous success. However, I look forward to the Program's ability to pivot in a way that keeps the research and startup companies relevant to meet the needs of the people of South Carolina and its industry partners. To continuing to accomplish its goal to creating startup companies that pay high wages, I hope the legislators will provide a steady funding stream to accomplish this important task."

LAURA B. CARDINAL, PH.D.
SmartState Center for Innovation + Commercialization

"At the core of this 20 year old SmartState Program are the Endowed Chairs, who have been instrumental in shaping the SmartState future. The knowledge assets created and built by the SmartState Program are the true fruits of this investment. This gives us an incredible competitive advantage for our state.
To take the next step, we as Endowed Chairs can reengage our stakeholders, reacquaint them with what we have accomplished so far, and inspire them with what we could do over the next 20 years with additional support, funding, and collaboration."

SmartState 2.0

LISA MAIN
SmartState Board Member
(2011 – Present)

"The SmartState Program has uniquely positioned South Carolina as a highly competitive player in our global economy, building our state's knowledge economy with top-tier researchers and giving our state's citizens tremendous job opportunities. My hope is that South Carolina's legislators see the magnitude of growth this Program has afforded us and continue to fund the Program for the next 20 years to come."

ROBERT W. PEARCE, JR.
SmartState Board Member
(2007 – Present)

"From the tremendous success of our public-private partnerships to job creation, particularly within our knowledge economy, I urge our legislators to have the faith and continued confidence that our Program works! This smart, multi-prong economic development strategy helped us grow our own while attracting world-class talent to our state using our research universities as drivers. If this Program no longer receives funding, it stifles our success and damages the robust economic development that has been a direct result of these hardwork efforts. We have a bright future in South Carolina. I hope the SmartState Program will continue to be invested in to be a part of that future growth."

SMARTSTATE PROGRAM®

Centers and Endowed Chairs

The work of South Carolina's SmartState Centers is exciting, groundbreaking, and of critical importance to the state, nation and world. These Centers, which align with industries in South Carolina, help elevate the state's economy and quality of life. What follows is an overview of each Center.

Program totals reported as of November 2021. In cases of joint proposals, Centers awarded by an institution are tallied by the fiscal agent. Endowed chairs are tallied based on the assigned institution. UofSC's assigned endowed chairs include one joint appointment with MUSC and Clemson. On the pages that follow, information about each SmartState Center includes the date the center was approved, the institution(s) awarded, the state award amount that must be matched with an equal amount of non-state investment, the appointed endowed chair(s) as of November 2021, reported extramural research funding (federal and private awards) above the match, and a brief description of the research focus. Centers are grouped by industry cluster. For updated information on centers and program totals, contact the S.C. Commission on Higher Education.

51 SmartState Program® Centers Awarded

86 SmartState Endowed Chairs Created

76 SmartState Endowed Chairs Appointed

10 SmartState Endowed Chairs Remaining to be Appointed

CLEMSON UNIVERSITY

13 Awarded
16 Created
14 Appointed
02 Remaining

UNIVERSITY OF South Carolina

18 Awarded
28 Created
24 Appointed
04 Remaining

MUSC MEDICAL UNIVERSITY of SOUTH CAROLINA

20 Awarded
42 Created
38 Appointed
04 Remaining

Advanced Materials & Nanotechnology

ADVANCED FIBER-BASED MATERIALS*

Award Date: 2006

State Award Amount: $4 million

University: Clemson

Endowed Chair(s):
Dr. Marek Urban
J.E. Sirrine Textile Foundation Endowed Chair in Advanced Fiber-Based Materials

Corporate Partner(s):
J.E. Sirrine Textile Foundation

External Funding Above Match:
$15.5 million

Research Focus: To provide the vehicle for repositioning existing research and manufacturing resources to support new industrial and entrepreneurial opportunities based on advanced polymeric-based materials.

ENVIRONMENTAL NANOSCIENCE AND RISK*

Award Date: 2008

State Award Amount: $3 million

University: UofSC

Endowed Chair(s):
Dr. Jamie Lead

External Funding Above Match:
$5.9 million

Research Focus: Understand the fundamental properties of nanomaterials and nanomaterials-environment interaction and use these principles to understand and help reduce impacts of nanomaterials used as well as develop and innovate nanotechnological applications.

EXPERIMENTAL NANOSCALE PHYSICS*

Award Date: 2003

State Award Amount: $4 million

University: UofSC

Endowed Chair(s):
Dr. Rongying Jin

External Funding Above Match:
$6.3 million

Research Focus: Perform basic and applied research of potential spintronic, optoelectronic and nanoelectronic devices and/or materials for future applications in information processing, high-speed, high density electronics, and bio chemical and radiation sensing.

MULTIFUNCTIONAL MATERIALS & STRUCTURES (MFMS)*

Award Date: 2013

State Award Amount: $2 million

University: UofSC

Endowed Chair(s):
Multifunctional Materials is recruiting one endowed chair.

External Funding Above Match:
$13.4 million

Research Focus: The development and supply of engineered materials for high technology industries such as aerospace by providing a foundation of research and development that will enable and enhance growth in the engineered materials field. Specific examples of research and development include: Lightning strike and EMF management, structural integrity, energy storage, essential power for commercial aircraft, and multiphysics-based micro/nano mechanics of dielectric materials.

OPTICAL MATERIALS/PHOTONICS*

Award Date: 2004

State Award Amount: $5 million

University: Clemson

Endowed Chair(s):
Dr. John Ballato
J. E. Sirrine Textile Foundation Endowed Chair in Optical Fiber

Corporate Partner(s):
J.E. Sirrine Textile Foundation

External Funding Above Match:
$35 million

Research Focus: Conduct optical and photonic materials research, particularly as relates to advanced optical fibers and fiber-based devices, and recruit and mentor graduate students with a focus on domestic scholars. Identify and foster the latest technologies and initiate partnerships with top national research universities and laboratories, aid South Carolina industry and economic development partners in the transfer of technology from Clemson to the public sector, and participate in the recruitment of optical technology firms to South Carolina.

POLYMER NANOCOMPOSITES*

Award Date: 2004

State Award Amount: $3.5 million

University: UofSC

Endowed Chair(s):
Dr. Brian Benicewicz
Materials Science & Engineering

Corporate Partner(s):
Michelin North American, BASF, U.S. Navy, PBI Performance Products

External Funding Above Match:
$18.5 million

Research Focus: Development of synthetic tools needed to control the environment precisely or interface between nanoparticles and polymer matrix applicable to optics, electronics, biological, medical, and structural material applications.

Graduated Center
Once a center has reached a point of full operability, the SmartState Review Board has the authority to graduate SmartState centers. A center must meet the requirements in the following key areas to be considered graduated: non-state match; all draw downs; endowed chairs and key personnel; initiatory programmatic activities have been achieved; the most recent annual report cites demonstrable programmatic activity; and match certification. Once a center is graduated, the majority of fiscal and administrative oversight responsibilities are transferred to the center's lead fiscal institution. Certain accountability and reporting obligations are retained by the graduated center.

Automotive & Transportation

AUTOMOTIVE DESIGN AND DEVELOPMENT*

Award Date: 2003

State Award Amount: $5 million

University: Clemson

Endowed Chair(s):
Dr. Zoran Filipi
Timken Endowed Chair in Automotive Design and Development

Corporate Partner(s):
Hertz Corporation, Duke Energy

External Funding Above Match:
$14 million

Research Focus: Focuses on the research and design of advanced powertrains for internal combustion engines and hybrid and electric vehicles, along with lightweight design and materials, functional integration and structural dynamics for vehicles.

AUTOMOTIVE MANUFACTURING*

Award Date: 2003

State Award Amount: $5 million

University: Clemson

Endowed Chair(s):
Dr. Laine Mears
BMW Endowed Chair in Automotive Manufacturing

Corporate Partner(s):
BMW

External Funding Above Match:
$17.2 million

Research Focus: Seeks to reinvent the vehicle production system through developing processes inspired by car designs (transitioning from Design-for-Manufacturing thinking to Manufacturing for-Design), and augmenting existing process capital through smarter model based control and applying energy fields to overcome material limitations. The guiding goals of this research are to improve productivity, reduce downtime, enhance quality, and more effectively integrate the human to the emerging digital information network.

AUTOMOTIVE SYSTEMS INTEGRATION*

Award Date: 2003

State Award Amount: $5 million

University: Clemson

Endowed Chair(s):
Dr. Chris Paredis, Clemson
BMW Endowed Chair in Automotive Systems Integration

Corporate Partner(s):
BMW, Mazda, GM and others

External Funding Above Match:
$9.5 million

Research Focus: Automotive diagnostics and prognostics, sustainable mobility, concepts, methods and tools. Deriving a simple, flexible energy management control strategy for plug-in hybrid electric vehicles.

SUPPLY CHAIN OPTIMIZATION AND LOGISTICS*

Award Date: 2005

State Award Amount: $2 million

University: Clemson

Endowed Chair(s):
Clemson is recruiting the Fluor Endowed Chair in Supply Chain Optimization & Logistics

Corporate Partner(s):
Fluor

External Funding Above Match:
$16.3 million

Research Focus: Interdisciplinary research addressing the multifaceted problems associated with supply chains. Deliver tangible supply chain optimization and logistics products and services through theoretical and applied research.

VEHICLE ELECTRONIC SYSTEMS INTEGRATION*

Award Date: 2004

State Award Amount: $3 million

University: Clemson

Endowed Chair(s):
Dr. Venkat Krovi
Michelin Endowed Chair in Vehicle Electronic Systems Integration

Corporate Partner(s):
Michelin

External Funding Above Match:
$5.8 million

Research Focus: Research to enable intravehicle and V2X automation, at subsystem, system, and system-of-systems levels, for automotive and vehicular applications.

Biomedical

ADVANCED TISSUE BIOFABRICATION

Award Date: 2007

State Award Amount: $5 million

Universities: MUSC, UofSC, Clemson

Endowed Chair(s):
Dr. Bruce Gao, Clemson
SmartState Endowed Chair in Biofabrication Engineering

Dr. Henry Sucov, MUSC
Endowed Chair in Biofabrication Biology

UofSC is recruiting an Endowed Chair in Biofabrication Engineering

External Funding Above Match:
$672,993

Research Focus: Develop innovative technologies and approaches that will enable repair, replacement, or restoration of diseased cells, tissues and organs.

BRAIN IMAGING*

Award Date: 2003

State Award Amount: $5 million

Universities: UofSC, MUSC

Endowed Chair(s):
Dr. Chris Rorden, UofSC
Endowed Chair in Neuroimaging

Dr. Hesheng Liu, MUSC
Endowed Chair in Imaging Science

Dr. Leonardo Bonilha, MUSC
Endowed Chair in Brain Imaging

External Funding Above Match:
$52.1 million

Research Focus: Creating a world-class brain imaging center. Initiated the first study using transcranial magnetic stimulation (TMS). Combined with functional MRI, TMS provides a short strong magnetic field useful for studying how the brain works. Specific studies include stroke-related brain injury and MRI physics techniques for clinical and neuroscience research.

CHILDHOOD NEUROTHERAPEUTICS*

Award Date: 2006

State Award Amount: $5 million

Universities: UofSC, MUSC

Endowed Chair(s):
Dr. Jeffery Twiss, UofSC
Child and Adolescent Neurochemistry

UofSC is recruiting an endowed chair in Translational Clinical Research

Dr. Bobby Thomas, MUSC
Neurodevelopmental Disorders

UofSC is recruiting an endowed chair in Childhood Neurotherapeutics

External Funding Above Match:
$13.8 million

Research Focus: Prevention of brain damage in premature infants and curing infant brain diseases through cellular engineering. Also, working on cognitive behavioral tasks in transgenic mice to determine if therapeutics can improve functional development outcomes, which may someday help children with ADHD.

CLINICAL EFFECTIVENESS AND PATIENT SAFETY*

Award Date: 2006

State Award Amount: $5 million

Universities: UofSC, MUSC

Endowed Chair(s):
Dr. John Schaefer, MUSC
Lewis Blackman Endowed Chair for Patient Simulation & Research for Health Sciences South Carolina

Dr. Jihad Obeid, MUSC
Biomedical Informatics

Dr. Cynthia Corbett, UofSC
Endowed Chair in Chronic Care Management

External Funding Above Match:
$12.9 million

Research Focus: Quality and safety of patient care, and improving the medical informatics aspects of data acquisition and the evaluation of health information technology on the quality and safety of clinical care processes and outcomes. The Center also focuses on developing South Carolina as a training center for physicians and other health professions using human simulators and sophisticated software-based training scenarios.

EFFECTIVENESS RESEARCH IN ORTHOPEDICS (CERotho)

Award Date: 2007

State Award Amount: $5 million

University: UofSC

Endowed Chair(s):
Dr. John Brooks

Corporate Partner(s):
Smith & Nephew

External Funding Above Match:
$17.3 million

Research Focus: Medical health needs in orthopaedic disorders, exercise and sports related injury prevention, treatment, and rehabilitation. The Center investigates the biologics of tissue-engineered materials and implantable devices to find solutions to musculoskeletal maladies.

**Graduated Center*

Biomedical

BIOMARINE ENVIRONMENTAL AND COASTAL HEALTH PROGRAM (BEACH)

Award Date: 2003

State Award Amount: $4 million

Universities: MUSC, College of Charleston

Endowed Chair(s):
Dr. Michael G. Janech, MUSC
Marine Environmental Biology

Alexander Alekseyenk, MUSC/CofC
Environmental and Biomedical Panomics

External Funding Above Match:
$12 million

Research Focus: Monitoring and predicting the impact of environmental changes on marine biosystems, which can, in turn, affect human health. Specific areas of study include environmental causation in wildlife, human disease and susceptibility, and mapping variability in genomes and populations; as well as research of shark and ray species.

HEALTHCARE QUALITY*

Award Date: 2007

State Award Amount: $5 million

Universities: MUSC, UofSC

Endowed Chair(s):
Dr. Les Lenert, MUSC
Medical Bioinformatics

Dr. Xiaoming Li, UofSC
Translational Clinical Research

Corporate Partner(s):
The Duke Endowment

External Funding Above Match:
$33.5 million

Research Focus: Creating a unique and comprehensive clinical data store that collects data from providers, enhances data usability, and makes it available in an easily accessible form for participants to use for clinical improvement and research purposes.

HEALTH FACILITIES DESIGN AND TESTING

Award Date: 2007

State Award Amount: $2 million

Universities: Clemson, MUSC

Endowed Chair(s):
Dr. Anjali Joseph, Clemson
SmartState Endowed Chair in Architecture and Health Research

Dr. Kenneth Catchpole, MUSC
Clinical Practice and Human Factors

External Funding Above Match:
$6.3 million

Research Focus: The impact of the built environment on health and healthcare delivery and the creation of architectural settings that promote health, safety, and the wellbeing of all users.

INFLAMMATION AND FIBROSIS RESEARCH*

Award Date: 2010

State Award Amount: $5 million

University: MUSC

Endowed Chair(s):
Dr. Carol Feghali-Bostwick
Kitty Trask Holt Endowed Chair for Scleroderma Diseases

Dr. Betty Tsao
Inflammation Research

External Funding Above Match:
$48.3 million

Research Focus: Develop new therapies and education programs for inflammatory and fibrosing rheumatic diseases such as lupus, scleroderma, and rheumatoid arthritis.

MOLECULAR PROTEOMICS IN CARDIOVASCULAR DISEASE AND PREVENTION*

Award Date: 2006

State Award Amount: $5 million

University: MUSC

Endowed Chair(s):
Dr. Amy Bradshaw, MUSC
Michael R. Zile Endowed Chair in Molecular Proteomics

Dr. Sheldon E. Litwin
Countess Alicia Spaulding Palozzi Chair in Cardiovascular Imaging

Dr. Thomas G. DiSalvo
Volpe SmartState Endowed Chair in Cardiovascular Biomarker Development for Diagnosis & Prevention

External Funding Above Match:
$8.6 million

Research Focus: Translation advances in basic bench science to clinical bedside care to improve the health care of the citizens of South Carolina.Priorities include diagnostic techniques, therapeutic management strategies, relations of protein signatures to clinical outcomes for risk assessment, and treatment of disease manifestation.

NEUROSCIENCES

Award Date: 2003

State Award Amount: $3 million

University: MUSC

Endowed Chair(s):
Dr. Christopher Cowan
William E. Murray Endowed Chair in Neuroscience

Dr. Vanessa Hinson
Josephine Tucker Morse Endowed Chair in Parkinson's Disease

Dr. Gonzalo Revuelta
Endowed Chair in Neurogenerative Diseases

External Funding Above Match:
$20.8 million

Research Focus: Brain neuromodulatory systems and their roles in cognitive performance, drug abuse, sleep and affective disorders. Other areas of research are movement disorders such as Ataxia, Choro, Bradykinesia and multiple system atrophy.

**Graduated Center*

Biomedical

PROSTATE CANCER DISPARITIES

Award Date: 2008

State Award Amount: $3.6 million

Universities: MUSC, UofSC, SCSU

Endowed Chair(s):
MUSC is recruiting AT&T Distinguished Endowed Chair in Cancer Equity in Cancer Disparities

Dr. Marvella Ford, MUSC/SCSU
Cancer Disparities

UofSC is recruiting one endowed chair in Cancer Disparities.

Corporate Partner(s): AT&T Foundation

External Funding Above Match:
$52.7 million

Research Focus: Facilitate statewide partnerships in cancer prevention and control research, clinical trials, and training to significantly decrease disparities in prostate cancer incidence and mortality in South Carolina.

PROTEOMICS*

Award Date: 2003

State Award Amount: $4 million

University: MUSC

Endowed Chair(s):
Dr. Richard Drake
Endowed Chair in Proteomics

Dr. Anand S. Mehta
Endowed Chair in Proteomic Biomarkers

External Funding Above Match:
$25.1 million

Research Focus: Develop and use high-end analytical technologies to understand the biologic profile of protein expression in health and disease. Developing enzyme based analytical methods to effectively detect biomolecules in tissues and tissue microarray platforms.

REGENERATIVE MEDICINE*

Award Date: 2003

State Award Amount: $5 million

Universities: MUSC, UofSC, Clemson

Endowed Chair(s):
Dr. Martin Morad, UofSC
BlueCross BlueShield of SC Foundation Chair in Cardiovascular Health

Dr. Stephen Duncan, MUSC
Regenerative Medicine and Cell Biology

Dr. Jeremy Gilbert, Clemson
Hansjörg Wyss Endowed Chair in Bioengineering

External Funding Above Match:
$45.3 million

Research Focus: Regenerative medicine approach for cardiovascular applications and provide expertise in clinical trials, statistics and/or assay development. Application of regenerative medicine and tissue engineering approaches to orthopaedic and neural diseases. Regeneration of tissue and organs for repairing, replacing, and maintaining organ function.

RENAL DISEASE BIOMARKERS

Award Date: 2008

State Award Amount: $5 million

University: MUSC

Endowed Chair(s):
Dr. Oleg Palygin, MUSC
Renal Biomarkers

Newton C. Brackett, Jr. MD
Endowed chair in Translational Nephrology Research.

External Funding Above Match:
$8.2 million

Research Focus: Identifying biomarkers that identify or predict prognosis for acute kidney injury, diabetic neuropathy, lupus nephritis, and focal segmental alomerulosclerosis.

SENIORSMART®

Award Date: 2007

State Award Amount: $5 million

Universities: UofSC, Clemson

Endowed Chair(s):
Dr. Sue Levkoff, UofSC
SmartHOME®

Dr. Julius Fridriksson, UofSC
SmartBRAIN™

Dr. Lesley Ross, CU
SmartLIFE®

External Funding Above Match:
$17 million

Research Focus: Three areas of research include: *SmartBRAIN™* (maintaining intellectual activity), *SmartWHEELS™* (independent mobility outside the home) and *SmartHOME®* (independent mobility inside the home) to foster independent living among seniors.

**Graduated Center*

Biomedical

STROKE*

Award Date: 2007

State Award Amount: $5 million

Universities: MUSC, UofSC

Endowed Chair(s):
Robert Adams, MUSC
Stroke

Dr. Mark Chimowitz, MUSC
Countess Alicia Paolozzi Endowed Chair in Translational Neurology

Dr. Souvik Sen, UofSC
Clinical Neurology

External Funding Above Match:
$31.6 million

Research Focus: Enhancing stroke treatment, prevention, and recovery. This Center is developing new stroke-related therapeutics, drug discovery, and biotechnology, and is a leader in stroke telemedicine.

TECHNOLOGY CENTER TO ENHANCE HEALTHFUL LIFESTYLES*

Award Date: 2009

State Award Amount: $3 million

Universities: MUSC, UofSC

Endowed Chair(s):
Dr. Kenneth Ruggiero, MUSC
Technology Applications for Disease Prevention, Management, and Risk Reduction

Dr. Delia West, UofSC
Technology Application for Health Behavior Change

External Funding Above Match:
$18.5 million

Research Focus: Develop and test lifestyle interventions for improving health, preventing illness and managing chronic health problems caused by physical inactivity, poor diets, and other lifestyle behaviors.

TOBACCO-RELATED MALIGNANCY

Award Date: 2007

State Award Amount: $5 million

University: MUSC

Endowed Chair(s):
Dr. Nancy DeMore
BMW Chair in Cancer Research

Dr. John Wrangle
The *Burtschy Family Distinguished Endowed Chair in Lung Cancer Research.*

Corporate Partner(s):
BMW

External Funding Above Match:
$77.8 million

Research Focus: Devoted to discovering tobacco-related malignancy biomarkers via clinical trials with a specific focus on tobacco-related cancers. Additionally, the Center is evaluating the specificity and sensitivity of novel biomarkers by molecular epidemiologic techniques across the diverse populations of South Carolina.

TRANSLATIONAL BIOMEDICAL INFORMATICS

Award Date: 2013

State Award Amount: $2 million

University: MUSC

Endowed Chair(s):
MUSC is recruiting Endowed Chair in Translational Biomedical Informatics

External Funding Above Match:
$539,697

Research Focus: The new Center will provide expertise in translational biomedical informatics essential for cutting-edge, innovative methodologies to link genetic/genomic data with vast amounts of clinical data. The contributions of the center to data sharing/analysis will decrease cost and increase efficiency in research and healthcare delivery and provide a robust IT platform for industry partnerships and new company formation.

VISION SCIENCE

Award Date: 2005

State Award Amount: $4.5 million

University: MUSC

Endowed Chair(s):
Dr. Baerbel Rohrer
Chair in Gene and Pharmaceutical Treatment of Retinal Degenerative Diseases

Dr. Yiannis Koutalos
Barbara and Stanley Andrie Endowed Chair in Bioengineering and Vision Research.

Corporate Partner(s): Alcon Labs, Taligen, Alexion Pharmaceuticals

External Funding Above Match:
$30.1 million

Research Focus: New treatments for macular degeneration, development of new anti-glaucoma agents and innovations in cataract surgery. The Center also focuses on using advances in bioengineering and material sciences to improve the diagnosis, treatment, and prevention of eye diseases.

****Graduated Center***

Energy & Alternative Fuels

CATALYSIS FOR RENEWABLE FUELS*

Award Date: 2005

State Award Amount: $3 million

Universities: UofSC

Endowed Chair(s):
Dr. John Regalbuto

External Funding Above Match:
$14.8 million

Research Focus: Developing catalysts that allow production of alternative fuels from renewable sources, thereby reducing dependence on imported oil and carbon fuel. The Center focuses on synthesizing inorganic catalysts for converting biomass to biofuels and synthesizing electrocatalysts for solar fuels and fuel cells.

GENERAL ATOMICS CENTER FOR THE DEVELOPMENT OF TRANSLATIONAL NUCLEAR TECHNOLOGY*

Award Date: 2009

State Award Amount: $3 million

University: UofSC

Endowed Chair(s):
Dr. Theodore Besmann
Energy and Nuclear Security

Corporate Partner(s):
General Atomics

External Funding Above Match:
$45 million

Research Focus: The production of biofuels and coal to liquid fuels using nuclear process heat for more efficient production and the reduction of wastes associated with recycling of used fuel, seeking more long term strategies to manage used fuel, recovery of energy value in used fuel, and eliminating concerns over proliferation associated with recycling used fuel.

NUCLEAR SCIENCE AND ENERGY

Award Date: 2008

State Award Amount: $3 million

Universities: UofSC

Endowed Chair(s):
Dr. Dan Gabriel Cacuci
Nuclear Power and Advanced Materials

Corporate Partner(s):
Duke Energy, Progress Energy, SCANA, Westinghouse

External Funding Above Match:
$7.3 million

Research Focus: Performance, efficiency, and maintenance issues at existing and future nuclear power plants using expertise modeling and simulation related to nuclear fuels and materials.

SMART GRID TECHNOLOGY

Award Date: 2013

State Award Amount: $5 million

University: Clemson

Endowed Chair(s):
Dr. Johan Enslin
Duke Energy Endowed Chair in Smart Grid Technology

Corporate Partner(s):
Duke Energy

External Funding Above Match:
$8.9 million

Research Focus: Develop technology to better plan and operate electric power systems.

SOLID OXIDE FUEL CELLS*

Award Date: 2006

State Award Amount: $3 million

Universities: UofSC

Endowed Chair(s):
Dr. Kevin Huang, UofSC
Solid Oxide Fuel Cells

External Funding Above Match:
$60.1 million

Research Focus: Develop solid oxide fuel cells for use in large, high-power systems such as industrial sites and electricity generating stations as well as for mobile power for computers, cell phones, and other electronics.

STRATEGIC APPROACHES TO THE GENERATION OF ELECTRICITY (SAGE)*

Award Date: 2007

State Award Amount: $5 million

Universities: UofSC

Endowed Chair(s):
Dr. Jochen Lauterbach

External Funding Above Match:
$14.2 million

Research Focus: Developing, improving, and advancing technologies to enhance the environmental performance of electricity production. Other work focuses on converting CO2 to chemicals, fuel cell and hydrogen storage-related research, and chemical production from coal to biomass.

**Graduated Center*

Information Science

CYBERINSTITUTE

Award Date: 2008

State Award Amount: $2 million

Universities: Clemson

Endowed Chair(s):
Clemson is recruiting the C. Tycho Howle Endowed Chair in Collaborative Computing Environments

Corporate Partner(s):
Omnibond Systems, LLC

External Funding Above Match:
$7.6 million

Research Focus: Connecting research and scholarship, particularly in interdisciplinary aspects of high-performance computing, networking, and data storage; the security of information systems and networks; human-computer interactions; interpretation; and visualization to the commercial sector via strategic industrial partnerships. Conduct research in conjunction with the Clemson University Cyber-Institute.

DATA ANALYSIS, SIMULATION, IMAGING, AND VISUALIZATION

Award Date: 2010

State Award Amount: $2 million

Universities: UofSC

Endowed Chair(s):
Dr. Wolfgang Dahmen
Williams-Hedberg-Hedberg Chair of Mathematics

External Funding Above Match:
$3.3 million

Research Focus: Develop technology for transforming data into knowledge concentrating on inline data processing, multi-sensor data acquisition, tissue modeling, atomic scale modeling, and bioimaging.

INNOVATION AND COMMERCIALIZATION

Award Date: 2004

State Award Amount: $5 million

University: UofSC
Graduated Center

Endowed Chair(s):
Dr. Laura B. Cardinal
Discovery and Innovation

Corporate Partner(s):
Fluor Foundation and Savanah River Nuclear Solutions LLC

External Funding Above Match:
$19.8 million

Research Focus: The innovation, commercialization, and new venture development of research in the SmartState Centers, leading to technology commercialization and transfer activities in collaboration with business organizations and public sector stakeholders.

OPTOELECTRONICS*

Award Date: 2008

State Award Amount: $2 million

University: Clemson

Endowed Chair(s):
Dr. Eric Johnson
PalmettoNet Endowed Chair in Optoelectronics

Corporate Partner(s):
Advanced Photonic Crystal, Tetramer Technologies

External Funding Above Match:
$13.1 million

Research Focus: Improving devices, systems, and protocols used in high-speed optical communications networks.

SUSTAINABLE DEVELOPMENT*

Award Date: 2010

State Award Amount: $4 million

University: Clemson

Endowed Chair(s):
Dr. Mark Johnson
Thomas F. Hash '69 Endowed Chair in Sustainable Development

External Funding Above Match:
$6.5 million

Research Focus: Developing new technologies to support real-time monitoring and management of natural and built environments through the Intelligent River® Project. The Center has created wireless sensor networks that can reliably monitor and transmit environmental data in near real time.

TOURISM AND ECONOMIC DEVELOPMENT*

Award Date: 2005

State Award Amount: $2 million

University: UofSC

Endowed Chair(s):
Dr. Lori Pennington-Gray

Corporate Partner(s):
Rawle Murdy
US Travel Association (USTA)

External Funding Above Match:
$601,297

Research Focus: Tourism is a $17 billion industry in South Carolina. The Center conducts cutting-edge tourism and hospitality research initiatives that will improve South Carolina's competitiveness as a tourism destination.

URBAN ECOLOGY AND RESTORATION*

Award Date: 2005

State Award Amount: $2 million

University: Clemson

Endowed Chair(s):
Dr. Robert F. Baldwin
Margaret H. Lloyd SmartState Endowed Chair in Urban Ecology

External Funding Above Match:
$8.7 million

Research Focus: Generating scholarship by building collaborations in applied ecology and environmental science, habitat ecology and restoration, wetland and watershed management; conservation biology; private-public networks for conservation; payments for ecosystem services; urban ecology; environmental education; and by developing careers of young scientists and educators.

Pharmaceutical

CANCER DRUG DISCOVERY*

Award Date: 2004

State Award Amount: $5 million

Universities: MUSC, UofSC

Endowed Chair(s):
Dr. John LeMasters, MUSC
GlaxoSmithKline Endowed Chair

Dr. Patrick Woster, MUSC
Chemical Biology/Medicinal Chemistry Endowed Chair

Dr. Mark Hamann, MUSC
Charles & Carol Cooper Chair in Pharmacy

Dr. Mitzi Nagarkatti, UofSC
Structural Biology Endowed Chair

Corporate Partner(s):
GlaxoSmithKline

External Funding Above Match:
$24.1 million

Research Focus: Advanced biomedical screening technologies to identify disease mechanisms and targets, and also screening drug candidates. Structural biology for target analysis, chemical biology for designing drug candidates, and advanced biomedical screening technologies.

CANCER STEM CELL BIOLOGY AND THERAPY*

Award Date: 2008

State Award Amount: $5 million

University: MUSC, UofSC

Endowed Chair(s):
Dr. Sophie Paczesny, MUSC
Abney Endowed Chair Remembering Sally Abney Rose

MUSC is recruiting for the Robert K. Stuart, MD Distinguished Chair in Hematology and Oncology

External Funding Above Match:
$35.9 million

Research Focus: Developing new technologies for isolating, growing, and manipulating cancer stem cells. This will enable the Center to find ways to use adult stem cells from bone marrow or organs to treat cancer.

Graduated Center

GASTROINTESTINAL CANCER DIAGNOSTICS

Award Date: 2005

State Award Amount: $5 million

Universities: MUSC

Endowed Chair(s):
Dr. Raymond Dubois, MUSC
Westerfield Coker Distinguished Chair in Gastrointestinal Malignancy

Dr. Albert Lockhart, MUSC
Grace E. DeWolff Endowed Chair in Medical Oncology

Corporate Partner(s):
Roche Carolina, Bank of America

External Funding Above Match:
$22.9 million

Research Focus: Clinical and translational gastrointestinal oncology and biomarker development and gastrointestinal (GI) malignancies Bringing state-of-the-art translational medicine to all GI cancer patients in South Carolina, thereby decreasing the overall impact of cancer mortality and morbidity and closing disparity gaps throughout the state.

LIPIDOMICS, PATHOBIOLOGY AND THERAPY*

Award Date: 2009

State Award Amount: $5 million

University: MUSC

Endowed Chair(s):
MUSC is recruiting for the chair in Lipidomics & Pathobiology

Dr. Besim Ogretmen
Lipidomics Drug Discovery

Corporate Partner(s):
Duke Energy

External Funding Above Match:
$41.8 million

Research Focus: Develop models for translational research and study of lipidomics and their pathobiology with an emphasis on cancer and inflammation.

MEDICATION SAFETY AND EFFICACY

Award Date: 2008

State Award Amount: $2 million

Universities: MUSC, UofSC

Endowed Chair(s):
Dr. Charles Bennett, UofSC
Frank P. and Josie M. Fletcher Professor of Pharmacy

External Funding Above Match:
$6.7 million

Research Focus: Increasing drug safety and effectiveness, as well as decreasing medication errors by identifying the incidence and significance of adverse drug events.

TRANSLATIONAL CANCER THERAPEUTICS*

Award Date: 2004

State Award Amount: $5 million

Universities: MUSC, UofSC

Endowed Chair(s):
Dr. Kenneth Tew, MUSC
John C. West Endowed Chair in Cancer Research

Dr. Igor Roninson, UofSC
Endowed Chair in Drug Efficacy

External Funding Above Match:
$42.8 million

Research Focus: Development of new approaches in cancer treatment, including the discovery and development of new drugs. Research also focuses on utilizing mouse models predisposed to cancer to study the impact of gene misregulation and therapeutic agents on tumor development, and the identification and inhibition of new cancer drug targets.

SMARTSTATE PROGRAM®
Endowed Chairs

The role of SmartState Program® Endowed Chairs is to serve as catalyst for the state's knowledge economy. Seventy-six chairs of 86 approved chairs have been filled at Clemson University, the Medical University of South Carolina, and the University of South Carolina across 51 SmartState Centers.

The SmartState Program® welcomed eight new endowed chairs this year: Albert Lockhart, Thomas DiSalvo, Raymond Dubois, Lori-Pennington Gray, Yiannis Koutalos, Oleg Palygin, Amy Bradshaw, Alexander Alekseyenko and Rongying Jin.

ROBERT ADAMS
Stroke
MUSC

ALEXANDER ALEKSEYENKO
BEACH
MUSC

ROBERT F. BALDWIN
Urban Ecology and Restoration
Clemson

JOHN BALLATO
Optical Materials/ Photonics
Clemson

BRIAN BENICEWICZ
Polymer Nanocomposites
UofSC

CHARLES BENNETT
Medication Safety and Efficacy
UofSC

THEODORE BESMANN
General Atomics
UofSC

LEONARDO BONILHA
Gastrointestinal Cancer Diagnostics
MUSC

AMY BRADSHAW
Molecular Proteomics
MUSC

JOHN BROOKS
Effectiveness Research in Orthopedics
UofSC

DAN GABRIEL CACUCI
Nuclear Science and Energy
UofSC

LAURA B. CARDINAL
Innovation and Commercialization
UofSC

KENNETH CATCHPOLE
Health Facilities Design and Testing
MUSC

MARK CHIMOWITZ
Stroke
MUSC

CYNTHIA CORBETT
CEPS
UofSC

CHRISTOPHER COWAN
Neurosciences
UofSC

WOLFGANG DAHMEN
Data Analysis Simulation Imaging and Visualization
UofSC

NANCY DEMORE
Tobacco-related Malignancies
MUSC

THOMAS DISALVO
Molecular Proteomics in Cardiovascular Disease and Prevention
MUSC

RICHARD DRAKE
Proteomics
MUSC

RAYMOND DUBOIS
Gastrointestinal Cancer Diagnostics
MUSC

STEPHEN A. DUNCAN
Regenerative Medicine
MUSC

JOHAN ENSLIN
Smart Grid Technology
Clemson

CAROL FEGHALI-BOSTWICK
Inflammation & Fibrosis Research
MUSC

ZORAN FILIPI
Automotive Design and Development
Clemson

MARVELLA FORD
Prostate Cancer Disparities
MUSC/SCSU

JULIUS FRIDRIKSSON
SeniorSMART®
UofSC

BRUCE GAO
Advanced Tissue Biofabrication
Clemson

JEREMY GILBERT
Regenerative Medicine
Clemson

LORI-PENNINGTON GRAY
Tourism and Economic Development
UofSC

MARK HAMANN
Cancer Drug Discovery
MUSC

VANESSA HINSON
Neurosciences
MUSC

KEVIN HUANG
Solid Oxide Fuel Cells
UofSC

MICHAEL JANECH
Marine Genomics
MUSC

RONGYING JIN
Experimental Nanoscale Physics
UofSC

ERIC JOHNSON
Optoelectronics
Clemson

MARK JOHNSON
Sustainable Development
Clemson

ANJALI JOSEPH
Health Facilities Design and Testing
Clemson

YIANNIS KOUTALOS
Vision Science
MUSC

VENKAT KROVI
Vehicle Electronic Systems Integration
Clemson

JOCHEN LAUTERBACH
Strategic Approaches to the Generation of Electricity (SAGE)
UofSC

JAMIE LEAD
Environmental Nanoscience and Risk
UofSC

JOHN LEMASTERS
Cancer Drug Discovery
MUSC

LES LENERT
Healthcare Quality
MUSC

SUE LEVKOFF
SeniorSMART®
UofSC

XIAOMING LI
Healthcare Quality
UofSC

SHELDON E. LITWIN
Molecular Proteomics in Cardiovascular Disease and Prevention
MUSC

HESHING LIU
Brain Imaging
MUSC

ALBERT LOCKHART
Gastrointestinal Cancer Diagnostics
MUSC

LAINE MEARS
Automotive Manufacturing
Clemson

ANAND S. MEHTA
Proteomics
MUSC

MARTIN MORAD
Regenerative Medicine
UofSC

MITZI NAGARKATTI
Cancer Drug Discovery
UofSC

JIHAD OBEID
Clinical Effectiveness and Patient Safety
MUSC

BESIM OGRETMEN
Lipidomics Pathobiology and Therapy
MUSC

SOPHIE PACZESNY
Cancer Stem Cell Biology and Therapy
MUSC

OLEG PALYGIN
Renal Disease Biomarkers
MUSC

CHRIS PAREDIS
Automotive Systems Integration
Clemson

JOHN REGALBUTO
Catalysis for Renewable Fuels
UofSC

BAERBEL ROHRER
Vision Science
MUSC

GONZO REVUELTA
Neurosciences
MUSC

IGOR RONINSON
Translational Cancer Therapeutics
UofSC

CHRIS RORDEN
Brain Imaging
UofSC

LESLEY ROSS
SeniorSMART®
UofSC

KENNETH RUGGIERO
Technology Center to Enhance Healthful Lifestyles
MUSC

JOHN SCHAEFER
Clinical Effectiveness and Patient Safety
MUSC

SOUVIK SEN
Stroke
UofSC

HENRY SUCOV
Advanced Tissue Biofabrication
MUSC

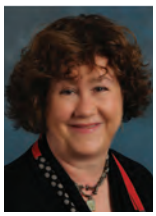
KENNETH TEW
Translational Cancer Therapeutics
MUSC

BOBBY THOMAS
Child Neurotherapeutics
MUSC

BETTY TSAO
Inflammation and Fibrosis Research
MUSC

JEFFERY TWISS
Childhood Neurotherapeutics
UofSC

MAREK URBAN
Advanced Fiber-based Materials
Clemson



DELIA WEST
Technology Center to Enhance Healthful Lifestyles
UofSC

PATRICK WOSTER
Cancer Drug Discovery
MUSC

JOHN WRANGLE
Tobacco-Related Malignancy
MUSC

SmartState Program® Contacts

South Carolina Commission on Higher Education

DR. RUSTY MONHOLLON
President and Executive Director
803.737.2155
monhollon@che.sc.gov

DR. ARGENTINI ANDERSON
Assistant Director of Academic Affairs
803.737.2276
aanderson@che.sc.gov

DR. MARIAM DITTMANN
Director of Academic Affairs Licensing
803.737.0141
mdittmann@che.sc.gov

University Research

DR. TANJU KARANFIL
Vice President for Research
tkaranf@clemson.edu

CHRIS GESSWEIN
Interim Executive Director
Clemson University Research Foundation
agesswe@clemson.edu

DR. LORI MCMAHON
Vice President for Research
mcmahonl@musc.edu

MICHAEL RUSNAK
Executive Director
Foundation for University Research
rusnak@musc.edu

DR. JULIUS FRIDRIKSSON
Vice President for Research
jfridrik@mailbox.sc.edu

WILLIAM KIRKLAND
Director
Office of Economic Development
kirkla@mailbox.sc.edu

University Media Relations

AMY SMITH
Vice President for University Relations and Chief Marketing and Communications Officer
864-656-4233
cmco@clemson.edu

HEATHER M. WOOLWINE, MA
Media Relations Director Foundation
843.792.7669
woolwinh@musc.edu

WES HICKMAN
University of South Carolina Director, News & Internal Communications
803.777.3478
whickman@mailbox.sc.edu

SMARTSTATESC.ORG

South Carolina Commission
on Higher Education

1122 Lady Street, Suite 400
Columbia, South Carolina 29201